

JOURNAL
OF
SOUTH AFRICAN BOTANY
VOL. XXIII.

Published: 1ST JULY, 1957.

SOME MARINE ALGAE FROM XAI-XAI¹

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(With Plates XXVIII—XXXIII)

INTRODUCTION

The algae listed in this paper were collected in July 1956.

Xai-Xai is a coastal village about nine miles from the small town Vila João in Moçambique. It is situated approximately ten miles in a north-eastward direction from the mouth of the Limpopo River and is at about 25° S. latitude. It thus falls within the general region of influence of the warm Agulhas Current.

The coast at Xai-Xai consists of sand dunes which slope down to low water level of spring tides or to a somewhat higher level. This low sandy level is fronted by a rampart of rock which forms a reef running more or less parallel to the sea. From an ecological point of view this reef provides three sets of habitats: (a) the landward side, (b) the reef top and (c) the seaward cliff. It was not possible to make a detailed ecological study but a few general comments are added.

The landward side.—The reef rises unevenly on the landward side providing a variety of habitats; more or less flat ledges, rock pools, boulders, and vertical or more or less vertical faces subject to varying degrees of illumination. The outstanding condition relating to this part of the reef as a whole is that it is protected from the impact of violent wave action. A considerable range of species occurs on the landward side among which may be named *Galaxaura corymbifera*, *Martensia elegans*, *Peyssonelia capensis* and *Pocockiella variegata*.

¹Sometimes written Chi-Chi (pronounced Shy-Shy).

The reef platform.—This slopes gently seaward and is characterised by numerous large shallow pools. In places on the landward side of the platform there is a girdle, usually narrow, of the oyster *Gryphaea cucullata*. Kalk (1954) showed that on the island of Inhaca this animal occurs from about mean high water of neap tides to about half-way between that level and the highest low water of neap tides. If we accept this intertidal range for *Gryphaea* at Xai-Xai, then the landward edge of the reef platform is in general at about high water level of neap tides. The seaward edge of the platform merges into the upper levels of the seaward side of the reef which is at about low water level of spring tides.

In general the algae occur from the lower limit of the *Gryphaea* girdle downwards, i.e. from about midway between high and low water neap tide levels to low water spring tide levels. This may seem to be a restricted range but the extent of algal growth on the reef platform is considerable due to the gentle slope of the platform, the numerous tide pools and the not inappreciable tidal range. In a northward direction on the east coast of southern Africa the extreme tidal range rises to 11·9 ft. (3·3 m.) in Delagoa Bay which is about twice the range at Durban (Kalk 1954). If we accept the levels and figures given by Kalk (1954) as applying to Xai-Xai, the algae on the reef platform occur from a little above mean tidal level to about mean low water spring tide level. The mid level of the platform corresponds roughly to or somewhat above the level of average low tide (A.L.T.).

Just below and at the lower limit of the *Gryphaea* girdle a more or less dense growth of a small *Enteromorpha* is found. Also at this level but only on firm substrata *Ulva rigida* occurs. *Ulva rigida* extends seawards from this level. Below the *Enteromorpha*—*Ulva* level plants of a variety of *Cystoseira myrica* are common in shallow pools and around the pool margins. At about A.L.T. level, patches of the brown-coloured zoanthid *Palythoa nelliae* are found and where these patches occur algae are practically excluded. In a variety of places from about this level downwards are to be found patches of *Jania intermedia*. More usually below A.L.T. level occur: *Caulerpa scapelliformis* in algal turf, patches of *Caulerpa racemosa*, and plants of *Sargassum elegans*. Occurring as a dominant in places towards the seawards edge is *Cheilosporum cultratum*. *Hormophysa triquetra*, *Padina commersonii* and *Zonaria subarticulata* are more characteristic of pools and shallow water. Dense growths of the Angiosperm *Cymodocea ciliata* occur in deep pools near the seaward margin of the reef platform.

The seaward cliff.—The seaward side of the reef is steeper than the landward side and in places is broken by deep clefts leading up into the

of the waves is considerable and collecting
are prominent species of the upper parts
elegans, *Rhodymenia natalensis*, *Gracilaria*

LIST OF SPECIES

is the same as that used in a recent paper
Algae of Inhaca Island and the Inhaca
d (1952) for siphonous chlorophyceae, of
chlorophyceae (1935) and of Kylin for the
e Florideae (1937).
literature are given for each species dealt
s listed in the first paper on Inhaca Algae
s referred to in the text as "Inhaca Algae".
page reference is given to the earlier paper
e will be found. Where a reference has not
in brackets. Books are referred to by their
the necessary details relating to the journal
lished are given except for such well-known
rgesen on the marine algae of Mauritius and
arpa where an abbreviated title for the mono-
ces will be found under "Literature cited".
cution of species on the coasts of the Union of
ement is made to the contrary, it is implied
d the species for the range indicated.

CHLOROPHYCEAE

ULOTRICHALES

Ulva rigida C. Ag.

See "Inhaca Algae", p. 165

This species is widely distributed on the reef platform extending
landward to the lower limits of the oyster (*Gryphaea cucullata*) girdle.

CLADOPHORALES

Chaetomorpha antennina (Bory) Kütz.

Sub-nom *Conferva antennina*.

(Bory: *Voyage dans les quatre principales Îles des Mers d'Afrique*,
vol. 2, p. 161, 1804.)

ACKNOWLEDGEMENT

Miss D. G. Winkler is indebted to the South African Council for
Scientific and Industrial Research for a Student Bursary which enabled
her to carry out the work described in her paper "Bydrag tot die Kennis
van Micropterum Schwant." Subgenus *Aethephyllum* (N.E. Br.),
Vol. XXIII, Pt. 1, Jan. 1957.

Sub-nom *Chaetomorpha antennina*.

Kütz.: *Species Algarum*, p. 379.

Vickers: *Phycologia Barbadosensis*, Part 1, p. 19, Pl. 8.

Börgeesen: *Marine Algae of the Danish West Indies*², Part 1, p. 16, Figs. 4—5.

Börgeesen: *Mauritius Algae*, Part 1, p. 37.

This alga was previously known in the Union as *Chaetomorpha media* (C. Ag.) Kütz. and was listed under this name by Levring (1938). Börgeesen (1940) gives some account of the variation in length of the long basal cell of filaments of *C. antennina* and discusses the relationship of material named *C. antennina* and *C. media*. Börgeesen recognises a range of variation in the length of the basal cell extending from 3—4 mm. at one extreme to 15—16 mm. at the other. (Börgeesen, 1940, pp. 35—39). A range of 4.7 mm. to 7.2 mm. long was recorded for the basal cell of plants collected at Xai-Xai.

On the parts of the reef examined this alga occurred as an occasional species.

In the Union this species grows on the Natal coast.

***Chaetomorpha crassa* (Ag.) Kütz.**

Agardh, C. A.: *Systema Algarum*, p. 99.

Kütz.: *Species Algarum*, p. 379.

This plant occurs as an epiphyte on algae of the lower intertidal levels.

Chaetomorpha crassa is known from the east coast of the Cape Province where I have collected it at East London and at Dwesa (about 70 miles north of East London). I have material of this species collected by Dr. Kolbe from Qolora (Isaac 499) which is about forty miles north of East London.

SIPHONALES

***Caulerpa filiformis* (Suhr) Hering.**

Sub-nom *Amphibolis filiformis*.

(Suhr: *Flora*, Vol. 17, p. 737, Pl. 2, Fig. 13.)

Sub-nom *Caulerpa filiformis*.

Hering: *Ann. Mag. Nat. Hist.*, Vol. 8, p. 91.

Papenfuss: *Bot. Notiser*, 1940, p. 201, Fig. 2.

Sub-nom *Caulerpa ligulata* (Harv. ms.)

Agardh, J. G.: *Till. Alg. Syst.*, 1, p. 10.

Sub-nom *Caulerpa flagelliformis* f. *ligulata*.

²Henceforth referred to as Marine Algae, D.W.I.

Weber v. Bosse: *Des Caulerpes*, p. 274, Pl. 24, Fig. 7.

For many years this plant was known in the Union as *Caulerpa ligulata*. The nomenclature and identity of the species has been discussed by Papenfuss (1940). According to Papenfuss *Caulerpa filiformis* corresponds in part to *Caulerpa flagelliformis* f. *ligulata* and in part to f. *typica* as defined by Weber van Bosse. The Southern African material corresponds well with f. *ligulata* but I have not observed plants corresponding to f. *typica*. For this reason and because of its marked difference from f. *ligulata* (cf. Weber van Bosse, 1898, Plate 24, Fig. 8 and 9) f. *typica* has been excluded above in listing under synonymy.

In addition to occurring at Xai-Xai this species was collected at Quissico (Zavala) about twenty miles north of Xai-Xai by J. Gomes Pedro and named by me. Herbarium specimens of this and of a few other algal species collected from Quissico by Gomes Pedro are housed in the Herbário de Moçambique in the Centro de Investigação Científica Algodoeira at Lourenço Marques. Subsequent references to Quissico distribution records refer to plants of this collection which I determined.

Caulerpa filiformis has a wide distribution on South African coasts especially for a species of this genus. It extends from the east coast of the Cape Peninsula to the northern Natal Coast. It is locally abundant in False Bay (Cape Peninsula) and also at Tergniet near Mossel Bay and is a common species in suitable habitats on the east coast of the Union. It grows rooted in sand in moderately sheltered waters (e.g., St. James in False Bay) and it also occurs attached to rock in moderately rough seas (e.g., locally at Port Elizabeth).

As far as I have been able to ascertain, the Xai-Xai and Quissico records are the first clear records of the existence of this species outside the Union of South Africa. Börgesen (1940) records a closely related form (*C. mauritiana* Börgs) from Mauritius.

***Caulerpa mexicana* Sonder ex Kütz.**

Kützinger: *Species Algarum*, p. 496.

Sub-nom *Caulerpa pinnata*.

Weber van Bosse: *Des Caulerpes*, p. 289, Pl. 24, Figs. 1—3.

The synonymy and identity of this species have been discussed by Papenfuss (1956) who regards the name *Caulerpa mexicana* as synonymous with inter alia *C. crassifolia* and *C. taxifolia* which names should be superseded. Eubank had earlier (1946) suggested that *C. taxifolia* and *C. crassifolia* might be conspecific and pointed out that the name *C. taxifolia* antedated *C. crassifolia*. South African material of the plant was referred to by Isaac (1956a) under the name *C. taxifolia* and Gold Coast plants were called *C. crassifolia* by Dickinson and Foote (1951).

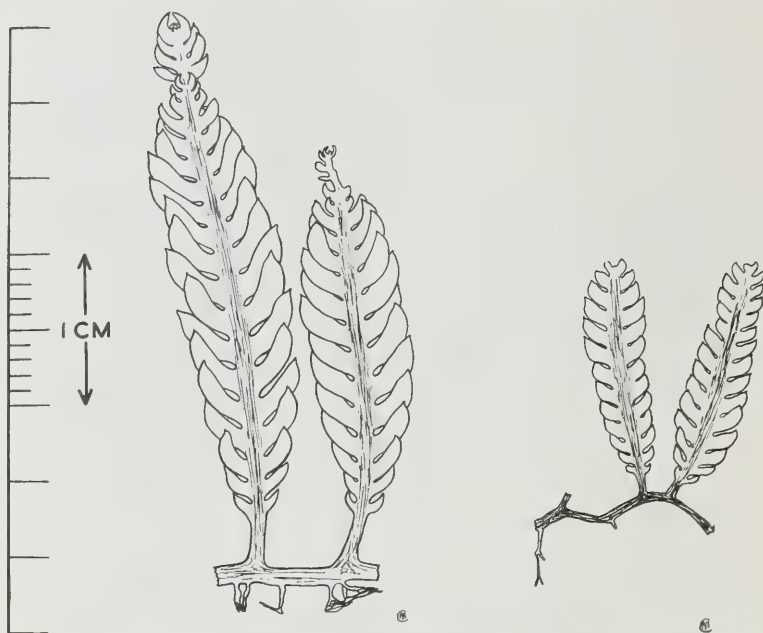


FIG. 1.—*Caulerpa mexicana* Sonder ex Kütz. Left, B.247 from Isipingo. Right, B.346 from Xai-Xai.

Plants of *Caulerpa mexicana* collected at Xai-Xai were of small size (Fig. 1 right), the fronds being less than 2 cm. high.

This species was collected by Pocock and Papenfuss at Durban and at Umhlanga Rocks on the Natal coast (Papenfuss, 1956). These plants were of similar dimensions to those collected at Xai-Xai. Material was also collected and sent to me from Isipingo (near Durban) by Mr. G. M. Thomson. Fronds of the Isipingo plants (Fig. 1, left) attained to heights of somewhat over twice the height of the Xai-Xai plants. The Isipingo material was examined by Miss Dickinson of Kew who was satisfied that it was the same taxon as the Gold Coast plant called *Caulerpa crassifolia*.

The plants collected at Xai-Xai and at Isipingo had simple unbranched fronds. Weber van Bosse's figures (sub-nom *Caulerpa pinnata*) depict branched fronds, but Eubank (1946) shows both branched and unbranched fronds.

***Caulerpa racemosa* (Forssk.) W. v. B.**

This is a notoriously variable species and a large number of varieties and forms have been described. Even so there are frequent difficulties

in delimitation so that, for example in Börgesen's writings, such qualifications as "near to forma", "shows some likeness to var.", or "most like" are found (Börgesen, 1913, 1946). One difficulty which has been experienced by me and by others who have worked with these plants is that different parts of a single plant may show characteristics belonging to different taxa that have been delimited as distinct varieties, forms and even species.

Some of the material collected at Xai-Xai was to a greater or lesser extent transitional between delimited varieties and plants could be found showing characteristics of more than one taxon. Taken as a whole, however, the material examined could be grouped around two varieties:

var **uvifera** (Turn.) W. v. B.

Sub-nom *Fucus uvifer*.

Turner: *Fuci*, Vol. 4, p. 82, Pl. 230.

Weber van Bosse: *Des Caulerpes*, p. 362, Pl. 33, Fig. 6, 7, 23.

Börgesen: *Marine Algae*, D.W.I., Part 1, Fig. 117 and 118.

var. **turbinata** (J. Ag.) Eubank.

Sub-nom *Caulerpa clavifera* var. *turbinata*.

(J. G. Agardh: *Novae species Algarum quas in itinere ad oras maris rubri.*, p. 173.)

Sub-nom *Caulerpa racemosa* var. *turbinata*.

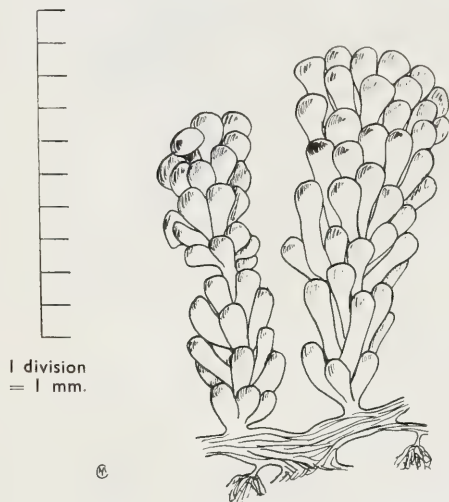


FIG. 2.—*Caulerpa racemosa* (Forssk.) W.v.B. var. *uvifera* (Turn) W.v.B. (Material: B.350.)



FIG. 3.—*Caulerpa racemosa* (Forssk.) W.v.B. var. *turbinata* (J. Ag.) Eubank.
(Material: B.351.)

Eubank: *Univ. Calif. Pubs. Bot.*, Vol. 18, p. 420, Fig. 2, O—Q.
Sub-nom *Caulerpa racemosa* var. *chemnitzia*.

Weber van Bosse: *Des Caulerpes*, p. 370, Pl. 31, Figs. 5—8.

Xai-Xai plants of these varieties are depicted in Fig. 2 and 3. Plants of the var. *turbinata* were found in which some pinnae showed a greater or lesser approach to the pinna character depicted for certain forms of var. *peltata* (Lamx) Eubank (Eubank 1946, p. 421).

Most of the material described above occurred in dense moderately sized mats. Plants showing a closer approach to var. *peltata* were characteristically found beneath overhanging rocks.

Caulerpa racemosa var. *turbinata* has been recorded from the east coast of the Union by Stephenson (1947) under the name of var. *chemnitzia*. Eubank (1946) pointed out that var. *turbinata* and var. *chemnitzia* are synonymous, and that the name var. *turbinata* has priority.

***Caulerpa scalpelliformis* (R. Br.) C. Ag.**

See *Inhaca Algae*, p. 168, Fig. 5.

Both var. *denticulata* (Decaisne) W. v. B. and var. *intermedia* W. v. B. were collected.

The species was fairly common, growing among other plants at about mid-level of the reef platform and a number of plants were observed in rock pools on the landward side of the reef,

The rock pool plants showed a luxuriant growth, most of the specimens collected being well differentiated var. *denticulata*.

***Chlorodesmis hildebrandtii* A. and E. S. Gepp.**

A. and E. S. Gepp: *The Codiaceae of the Siboga Expedition*, p. 16,
Pl. 8, Fig. 74 and 75.

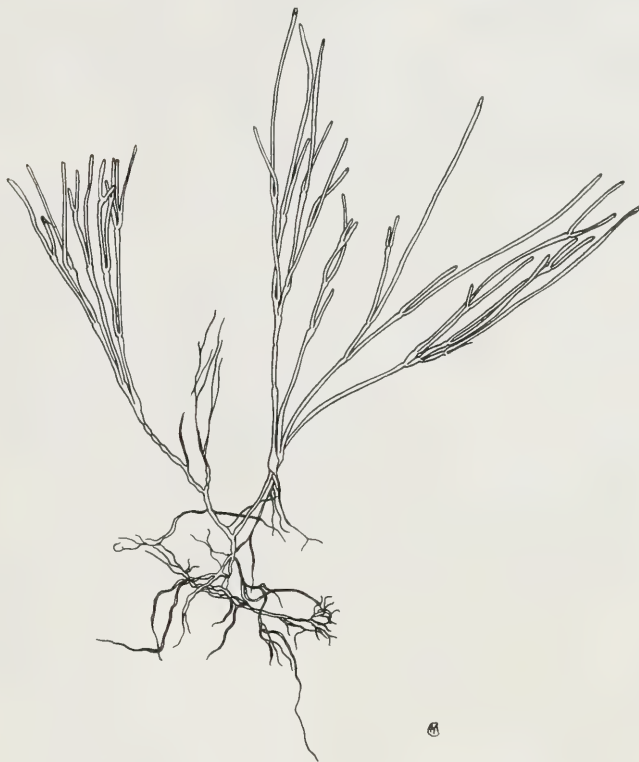
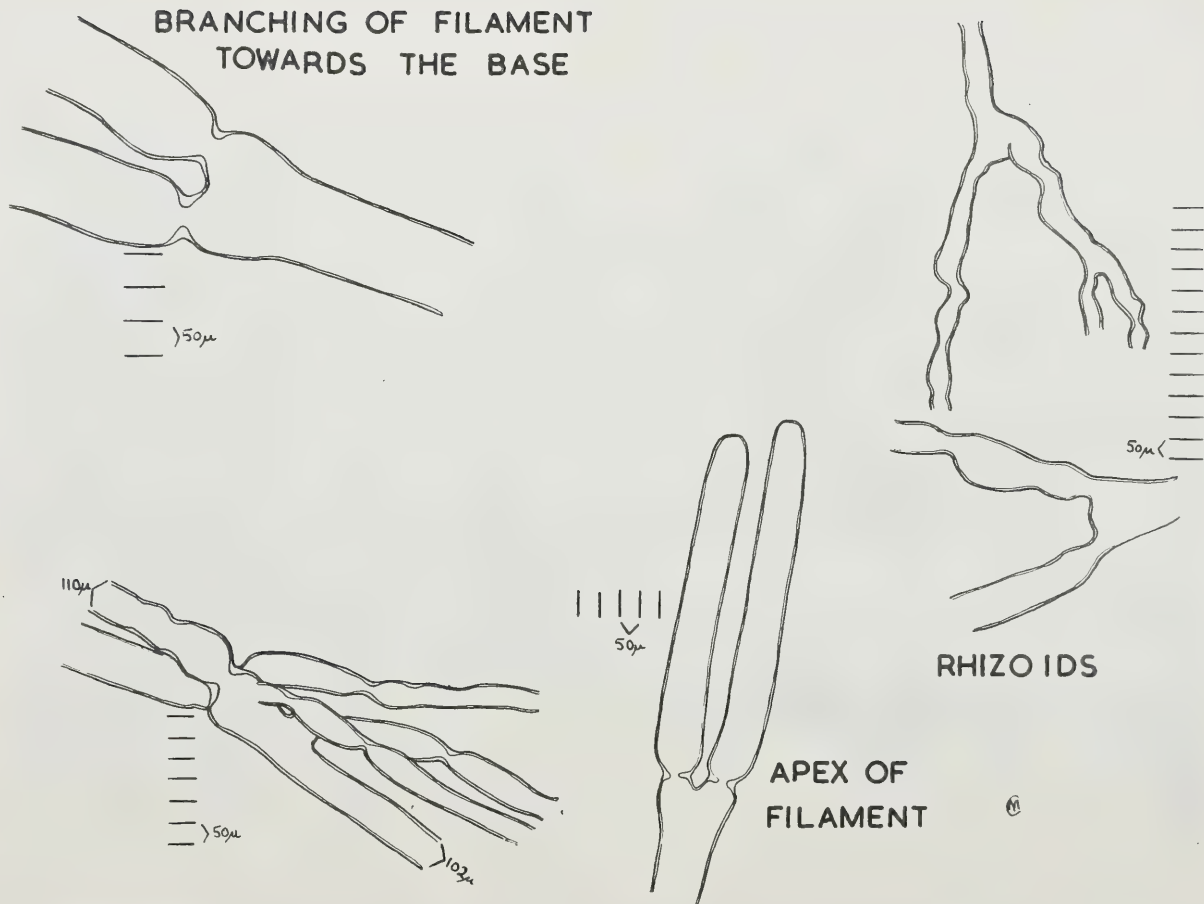


FIG. 4.—*Chlorodesmis hildebrandtii* A. and E. S. Gepp. (B.348) $\times$ 2.

The general habit of this species is illustrated in Fig. 4. The plants collected are perhaps somewhat small in size, growing to a height of about 4 cms. whereas A. and E. S. Gepp give a height of about 6 cms. The plants grow in dense, flexible tufts which have a beautiful silky green sheen. Details of structure are shown in Fig. 5 which illustrates the characteristic constrictions of the filaments placed evenly above the dichotomies of the branches. This characteristic distinguishes the species from *C. comosa* in which the constrictions are unevenly placed above the branch dichotomies.



RHIZOIDS

FIG. 5.—Structure of filaments and rhizoids of *Chlorodesmis hildebrandtii* A. and E. S. Gepp.

Halimeda cuneata Hering.

See "Inhaca Algae", p. 170, Pl. 36.

Well-developed plants of this species were collected. This plant also occurs at Quissico.

Udotea orientalis A. and E. S. Gepp.

See "Inhaca Algae", p. 171, Pl. 37.

The plants collected were up to about 5 cms. high.

SIPHONOCCLADALES

Chamaedoris delphinii (Hariot) Feldm. et Börgs.

See "Inhaca Algae", p. 172, Pl. 38.

Valonia macrophysa Kütz.

See "Inhaca Algae", p. 173.

Valoniopsis pachynema (Mart.) Börgs.

Sub-nom. *Bryopsis pachynema*.

Martens: *Die Tange*, p. 24, Pl. 4, Fig. 2.

Sub-nom. *Valoniopsis pachynema*.

Börgesen: Marine Algae from the Northern Arabian Sea, p. 10, Fig. 1 and 2.

This species forms dense mats of green, branching filaments. The mats may be a few centimetres high and mats with diameters of 5 to 7 cms. were collected (Plate XXVIII a). When fresh, the plants are rigid due

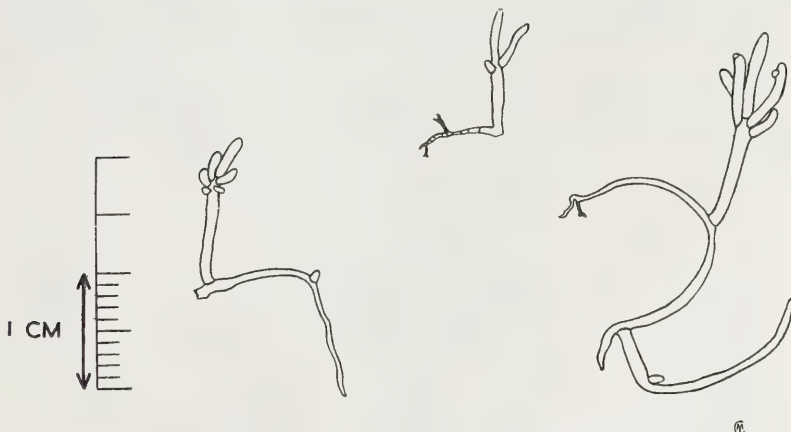


FIG. 6.—Portions of *Valoniopsis pachynema* (Mart) Börgs (B.331) showing details of branching.

to the turgidity of the filaments but in preservative the plants become flaccid.

The manner of branching is variable and a range of variations has been described by Börgesen. Two general characteristics may be noted: (a) the point at which a branch has grown out is marked by a cross wall; (b) branching is basipetal and hence the oldest and largest branch of a series is the most distally placed (Fig. 6). The mats are attached to the substratum by rhizoidal branches which bear small haptera. These rhizoidal branches have numerous cross walls which occur without any

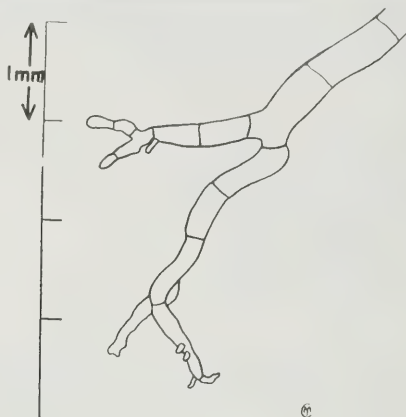


FIG. 7.—Part of rhizoidal system of *Valoniopsis pachynema* (Mart) Börgs (B.331) more highly magnified.

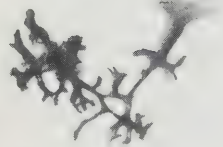
relationship to branching (Fig. 7). In the non-rhizoidal filaments cross walls occur only in relation to branches and the cutting off of small hemispherical masses at the tips of filaments from which apical segments new branches will arise. In material preserved in formalin-sea water these small cut off segments are conspicuous on account of their dark brown colour (Plate XXVIII a).

The material examined agreed very well with Börgesen's account of the species but two minor deviations may be noted. In the first place the filaments are somewhat coarser. Whereas Börgesen states that the filaments have a diameter of 0.6 to 0.7 mm., the Xai-Xai material had diameters of up to 1.0 mm. and sometimes even a little wider. Secondly, although most of the filaments grow vertically at first the majority sooner or later bend more or less horizontally in a manner recalling a diageotropic response. Some branches grow down again towards the substratum.

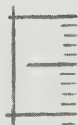


PLATE XXVIII.

a. (upper) *Valoniopsis pachynema*
(Mart.) Börgs. Material (B.331)
preserved in formalin—sea water.
The dark bodies seen in the photo-
graph are small segments cut off by
transverse walls, the contents of
which have become dark coloured.



1 cm.



b. (lower) *Dictyopteris delicatula*
Lamour. (Isaac 708.)



PLATE XXIX.

Range of erect forms of *Pocockiella variegata* (Lamour) Papenfuss.

PHAEOPHYTA

ECTOCARPALES

Ralfsia expansa J. Ag.

See "Inhaca Algae", p. 176.

DICTYOTALES

Dictyopteris delicatula Lamour.

(Lamouroux: *Nouv. Bull. Sc. Soc. Philom.*, 1: 332, Pl. 6, Fig. 2b.)

Vickers: *Phycologia Barbadosensis*, Part 2, Pl. 3.

Taylor: *Plants of Bikini*, p. 101.

The plants examined were sterile and small, with a breadth usually of well under 3 mm. and a total height rarely exceeding 2 cm. The basal attaching portion of the plant was well developed and was sometimes more extensive than the erect part (Plate XXVIII b).

It was easy to overlook these plants as they were not obvious on the shore. On disentangling dense clumps of seaweeds a fair amount of this species was found.

Dictyopteris delicatula was collected at Umpangazi on the north Natal coast by Stephenson (1947); Papenfuss (1943) also records the species for the Natal coast.

Dictyopteris longifolia, Papenfuss ined.

See "Inhaca Algae", p. 177, Pl. 39.

Padina commersonii Bory.

See "Inhaca Algae", p. 177, Fig. 13 (p. 178) and Pl. 40.

Pocockiella variegata (Lamour) Papenfuss.

For references to literature see "Inhaca Algae", p. 178.

This polymorphic species includes prostrate forms which are closely adherent to the substratum, prostrate forms which are much more loosely attached to the substratum and erect forms. It is also clear from the literature that the colour varies from brown to almost black.

Throughout these variations the following features are constant.

- (1) Anatomical structure.
- (2) Characters relating to the structure of the asexual reproductive organs.

In section the plant body is differentiated into three regions. There is a central region consisting of a single series of relatively large cells which are flanked on either side by a cortex consisting of two, three, four or sometimes more cells usually of a length equal to those of the central cells but decidedly narrower. The cortex is typically bounded by an

outer series of smaller cells, in section there being two of these corresponding to the length of the cortical and central cells.

In regard to the reproductive structures of the asexual plant it is now generally agreed that paraphyses are absent and that the loosely aggregated sporangial sorus has an indusium. This indusium is easily lost in sectioning mature fertile asexual plants.

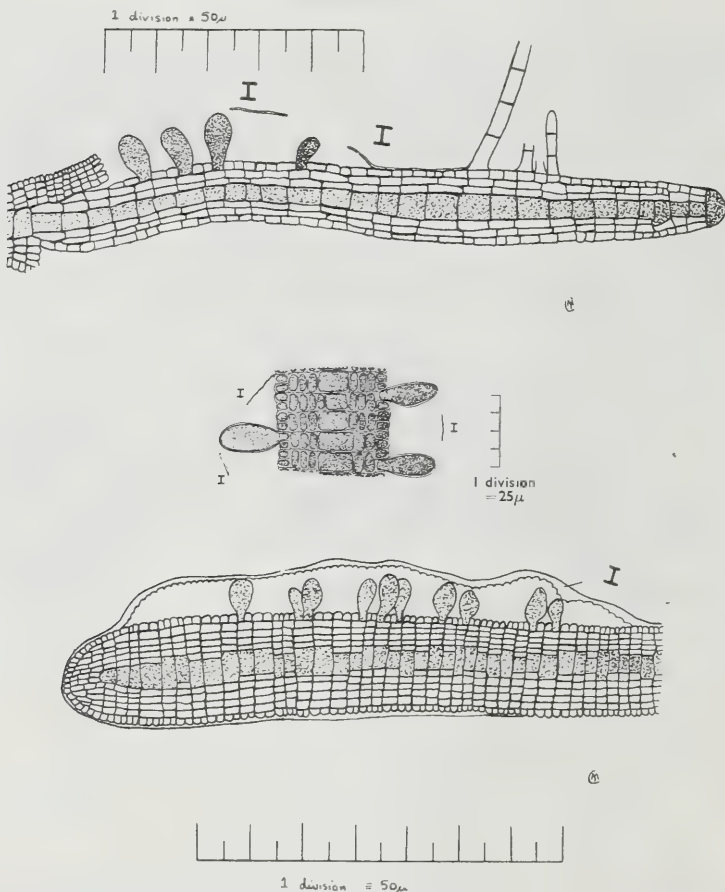


FIG. 8—10. Sections of *Pocockiella variegata* (Lamour) Papenfuss. Fig. 8 (top). B.369, a partly prostrate plant of yellow-brown colour. Fig. 9 (middle). B.370, a dark coloured plant. Fig. 10 (bottom). Isaac 720—the plant shown in the lower right hand corner of Plate 2. . . I = Indusium.

A number of erect plants and one partly prostrate plant were collected from rock pools on the landward side of the reef at Xai-Xai. These plants varied much in colour and form. Some were almost black in colour, some dark brown and others were medium brown. A range of forms is illustrated in Plate 2. Some of these plants have a simple fan-like form, others while retaining a general fan-like outline are more lobed and cut up into segments. Still others are much lobed and broken up into separate segments and show a greater or lesser degree of divergence of lobes from one another. Throughout these colour and form variations the essentials of anatomical structure remain the same (Figs. 8, 9 and 10). Three specimens (B369, B370 and Isaac 720) were fertile asexual plants. One of these was yellow-brown, partly prostrate, with a fan-like erect portion (B369) and another was dark coloured with division of the thallus into numerous moderately elongated segments (B370). In all these cases the form and dimensions of the sporangia were essentially the same; no paraphyses were observed; and an indusium was present. Special attention may be called to Isaac 720 (Fig. 10). Here the form of the plant approximates towards figures of *Pocockiella nigrescens* (see Papenfuss 1943a, Fig. 15; Kütz., *Tab. Phyc.*, Vol. 9, Pl. 49, Fig. 2) but the anatomy is the same as that of the other plants. A very clearly defined indusium was noted in this specimen. It may be commented here that although Papenfuss considers that *P. nigrescens* may be a distinct species on the basis of Kützing's anatomical figure, the present author fails to see any essential difference in anatomy between Kützing's section for *P. nigrescens*, Papenfuss's section for *P. variegata* and the anatomy shown in Figs. 9 and 10 for plants collected at Xai-Xai and here included under *P. variegata*.

***Zonaria subarticulata* (Lamour) Papenfuss.**

Sub-nom. *Phycopteris cuneata*.

Kütz.: *Tab. Phyc.*, Vol. 9, p. 27, Pl. 67, Fig. 2.

For nomenclature and identity of South African plant, see Sub-nom.

Zonaria cuneata.

Papenfuss: *Farlowia*, Vol. 1, 340.

Sub-nom. *Zonaria subarticulata*.

Papenfuss: *Jour. S. Afr. Bot.*, Vol. 17, p. 168.

This species has long been known in South Africa as *Zonaria interrupta* (Lamour) Ag. but Papenfuss has shown that this name is incorrect for the South African plant and pointed out that the name should be *Z. cuneata* (Papenfuss, 1944). Later Papenfuss put forward a case for the view that *Zonaria cuneata* and *Z. subarticulata* are conspecific and that the latter name should be used (Papenfuss, 1951). It is not necessary

to go into detail here as the matter was fully dealt with by Papenfuss in his second paper.

The Xai-Xai plants collected are well developed being often about 15 cm. high (Plate XXX). They are somewhat narrower than the South African plants although the latter are usually smaller. Fertile diploid plants were examined and some of these were clearly over ripe as numerous empty sporangia were observed (Fig. 11).

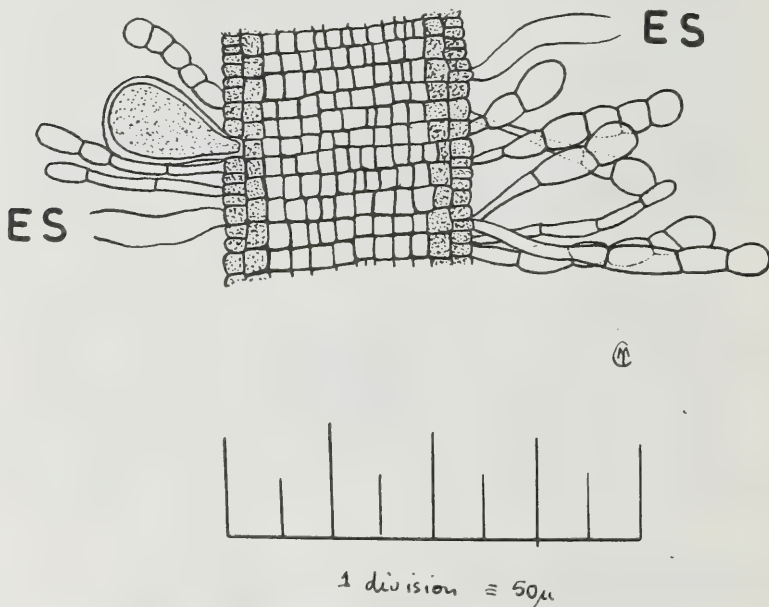


FIG. 11. T.S. of part of sporangial sorus of *Zonaria subarticulata* (Lamour) Papenfuss (B.373) showing two empty sporangia; (E.S. = empty sporangium.)

At Xai-Xai *Zonaria subarticulata* dominates the vegetation in many of the long relatively shallow pools of the reef platform where it displays a dense and luxuriant growth.

The plant is widely distributed on the South and East coasts of the Union.

PUNCTARIALES

Colpomenia sinuosa (Roth) Derb et Sol.

See "Inhaca Algae", p. 180.

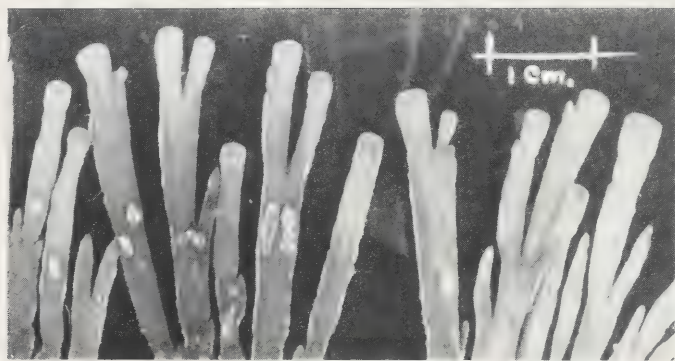
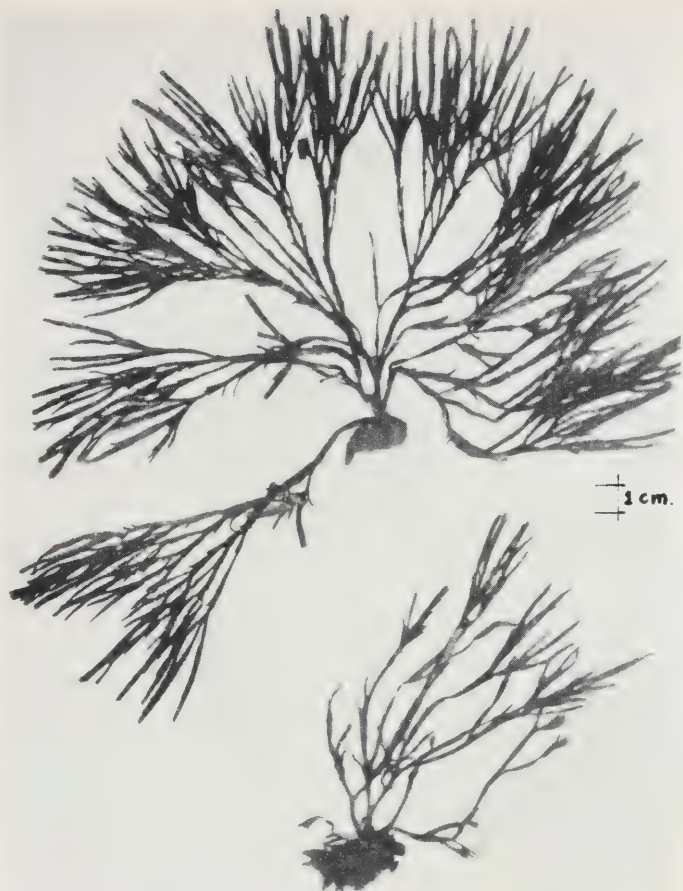


PLATE XXX.

(upper) *Zonaria subarticulata* (Lamour) Papenfuss (Isaac 702).

(lower) Frond apices.

FUCALES

***Cystoseira myrica* (Gmelin) J. Ag.**

Thanks are due to Prof. J. Feldmann for the identification of specimens as being a form of *Cystoseira myrica*. The plant will be dealt with in a subsequent paper on the marine algae of Inhaca Island and the Inhaca Peninsula.

At Xai-Xai this species was widespread and common on the landward side of the reef platform where it was found in pools and around pool margins.

***Hormophysa triquetra* (L.) Kütz.**

See "Inhaca Algae", p. 181, Pl. 42.

This is widespread on the reef platform where it occurs in pools and in situations where it is left more or less uncovered by the receding tide.

***Sargassum elegans* Suhr.**

Suhr: *Flora*, Vol. 23, p. 257.³

De Toni: *Sylloge Algarum*, Vol. 3, p. 110.

This species is included by de Toni under "Species imperfecte descriptae, dubiae aut steriles". The available descriptions by von Suhr and by de Toni are certainly meagre.

Diagnostic characteristics given in the descriptions cited above include:

- (a) Narrow, linear and entire leaf-like segments.
- (b) Alternating side branches forming a wide angle with the axis bearing them.
- (c) Receptacles mostly simple and conical.

The identification of specimens by the application of these criteria often presents difficulties as for example, the insistence on entire margins of leaf-like segments. The species needs further study especially in regard to its range of variability. Thus not all of the leaf-like segments on the same plant are necessarily entire and Papenfuss has identified the following plants in the British Museum of Natural History as *Sargassum elegans* although they have widely spaced serrations.

Two sheets from Herb. R. J. Shuttleworth:

- (a) Recl. 1877 C.B.S. Africa Aust. Legit Drege 1840.
- (b) Ad Cap. b Spei. Meisner 1834.

One sheet from Herb. Alg. Dickie: 1884.

Cape of Good Hope.

³The author is indebted to Mr. R. Ross of the British Museum of Natural History for a written copy of von Suhr's description of this species.

Sargassum elegans is a common plant at Xai-Xai where it occurs in clumps on the reef platform especially at the seaward edge where it is subjected to strong wave action. The plants frequently show a dwarfed growth. It has also been collected at Quissico.

This species is widely distributed on the south and east coasts of the Union where in general it becomes relatively more abundant with increasing sea temperature. This observation was also made by Stephenson (1947).

***Sargassum heterophyllum* (Turn) C. Ag.**

Sub-nom. *Fucus heterophyllus*.

Turner: *Fuci*, Vol. 2, p. 62, Pl. 92 (in part).

Sub-nom. *Fucus incisifolius*.

Turner: *Fuci*, Vol. 4, p. 39, Pl. 214 (in part).

Sub-nom. *Sargassum heterophyllum*.

C. A. Agardh: *Species Algarum*, 1 (1), p. 21 (in part).

Sub-nom. *Sargassum incisifolium*.

C. A. Agardh: *Species Algarum*, 1 (1), p. 14 (in part).

For identity and nomenclature see:

Setchell: *Univ. Calif. Publ. Bot.*, Vol. 17, p. 207, Pl. 38.

Papenfuss: *Symbolae Botanicae Upsaliensis*, Vol. 4, No. 3, p. 8.

Papenfuss: *Jour. S. Afr. Bot.*, Vol. 17, p. 171.

Papenfuss (1951, p. 171) states that "observations in the field and study of liquid preserved and dried specimens of *Sargassum incisifolium*" have led him to the conclusion that *S. incisifolium* and *S. heterophyllum* are conspecific. Since *Fucus heterophyllus* was described and figured by Turner in 1809 and *F. incisifolius* in 1819 the earlier name is the valid one. According to Papenfuss "the plants of *S. heterophyllum* tend to be dioecious . . . The plants which are largely male represent the stage which usually has been assigned to *S. incisifolium* and those which contain largely female conceptacles have usually been referred to *S. heterophyllum*." (Ibid., p. 171.) For details of nomenclature and identity reference should be made to the papers by Setchell and Papenfuss cited above.

Only a few plants of *Sargassum heterophyllum* were collected at Xai-Xai.

This species is widely distributed on the south and east coasts of the Union of South Africa and occurs in the Langebaan—Saldanha lagoon on the west coast in which locality higher sea temperatures occur than are typical for the west coast (Isaac 1937, 1956c). *Sargassum heterophyllum* is most typical of moderately warm waters and becomes progressively less prominent in a northward direction on the east coast of the Union, as was also observed by Stephenson (1947).

FLORIDEAE

NEMALIONALES

Galaxaura corymbifera Kjellm.

(Kjellman: *Galaxaura*, p. 87.)

Kylin: Rhodophyceen von Südafrika, p. 6, Pl. 2, Fig. 5.

This is a common species on the landward side of the reef platform occurring on vertical rock surfaces at low intertidal levels and in rock pools.

G. corymbifera occurs on the Natal coast.

Galaxaura tenera Kjellm.

See "Inhaca Algae", p. 182.

GELIDIALES

Gelidiopsis rigida (Vahl) Web. v. Bosse.

See "Inhaca Algae", p. 182.

Gelidium caespitosum Kylin.

See "Inhaca Algae", p. 183, Fig. 15.

Gelidium reptans (Suhr.) Kylin.

See "Inhaca Algae", p. 184, Fig. 17.

CRYPTONEMIALES (CORALLINACEAE)

Cheilosporum cultratum (Harv.) Aresch.

Areschoug in J. G. Agardh: *Species Genera et Ordines*, Vol. 2, Pt. 2, p. 545.

Manza: *Philippine Jour. Sci.*, Vol. 71, p. 293.

Sub-nom. *Amphiroa cultrata*.

Harvey: *Nereis Australis*, p. 102, Pl. 39.

This species (Fig. 12) is common in places on the reef platform especially near the seaward edge. Fertile tetrasporic material was collected (Fig. 13).

On the Union Coast Stephenson (1947) records this species from Isipingo (near Durban) to St. James on the east coast of the Cape Peninsula.

Jania intermedia Kütz.

Kütz: *Tab. Phyc.*, Vol. 8, p. 37, Pl. 79 I, Pl. 86, IV.

The branching, the form and proportions of the intergenicula (calcified segments) and the character of the fertile branches (Figs. 14 and 15)

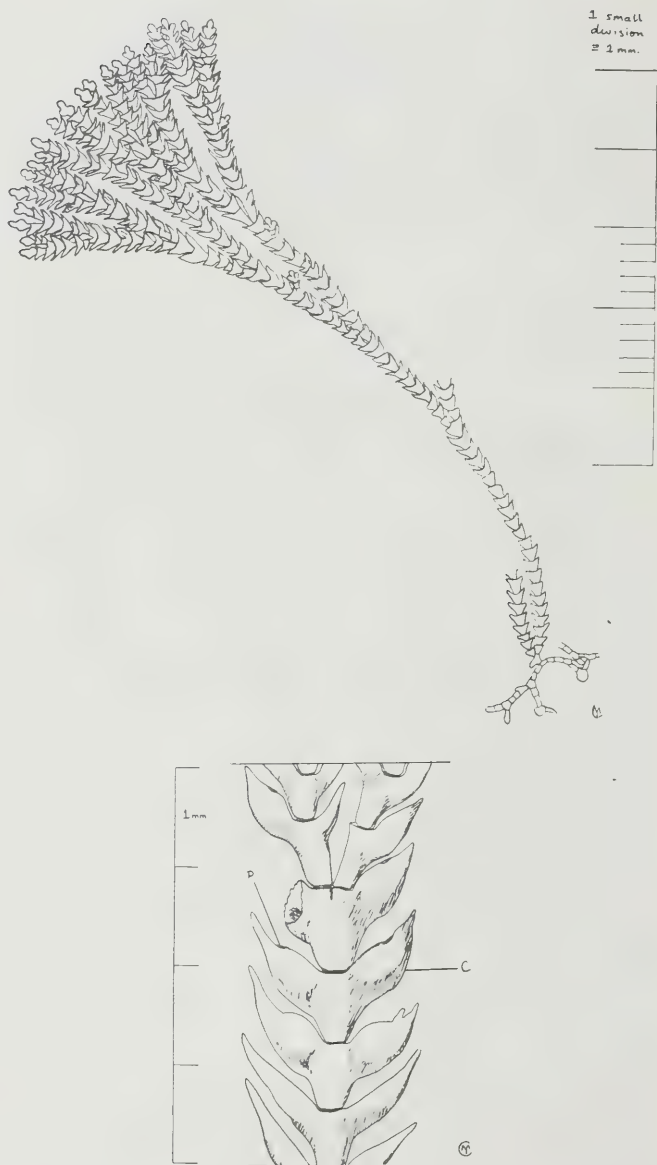


FIG. 12 and 13. *Cheilosporum cultratum* (Harv.) Aresch (B.357). FIG. 12, (top) General habit; FIG. 13 (bottom), Fertile portion more highly magnified. P = pore; C = conceptacle.



FIG. 14. *Jania intermedia* Kütz (B.358). General habit.

correspond to Kützing's designation as depicted in *Tabulae Phycologicae*. The number of transverse zones per intergeniculum which appear after clearing with dilute hydrochloric acid agrees with Kützing's depiction. For help in determining this material thanks are due to Dr. M. A. Pocock. Much of the material examined was tetrasporic.

This species is listed by Barton (1893, p. 204) who gives the distribution as "Cape" (Hohenack, No. 589). Kützing gives "caput bonae spei". Such wide designations have little meaning.

CRYPTONEMIALES (OTHER THAN CORALLINACEAE)

Peyssonelia capensis Mont.

(Montagne: *Ann. Sci. Nat.*, sér 3, Bot., Vol. 7, p. 177.)

Sub-nom. *Peyssonelia major*.

Kützing: *Species Algarum*, p. 693.

Kützing: *Tab. Phyc.*, Vol. 19, p. 31, Pl. 88.

Kylin: *Rhodophyceen von Südafrika*, p. 8, Pl. 3, Fig. 6.

According to Papenfuss (1951) *P. capensis* and *P. major* are conspecific.

The epithet *capensis* antedates that of *major*.

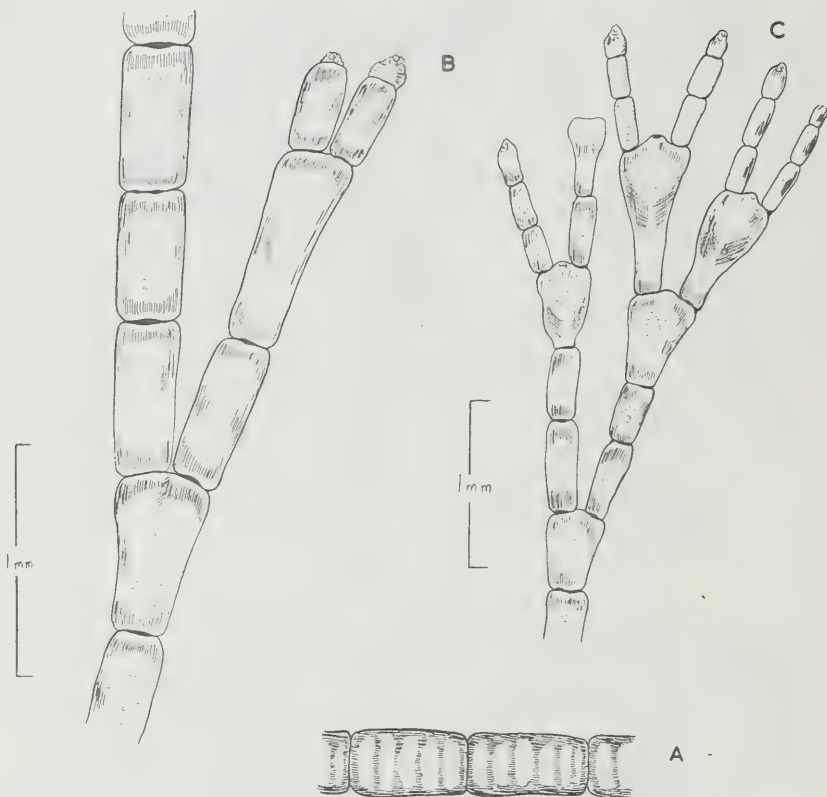


Fig. 15, *Jania intermedia* Kütz (B. 358). A. Portion of frond cleared with hydrochloric acid to show transverse zones. B and C. Details of structure.

This species was common to locally abundant on vertical surfaces on the landward side of the reef.

The distribution data for the Union coast are meagre. Stephenson (1947, p. 307) states: "Probably Umpangazi (and certainly Isipingo) to Richmond, 7 stations. . . . A plant collected at Arniston by M. A. Pocock was also identified by her as this species." Papenfuss (1951, p. 175) writes that this species ". . . is common in certain areas along the eastern coast of South Africa . . .". I have collected *Peyssonelia capensis* at Tergniet near Mossel Bay which is, however, not as far west as the Arniston (east coast of Cape Agulhas) record.

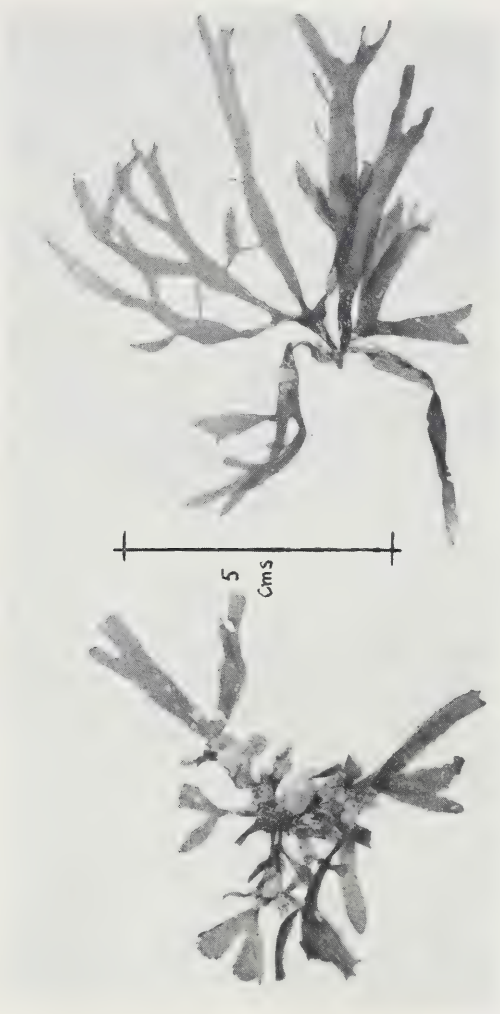


PLATE XXXI. *Gracilaria denticulata* Schmitz ex Mazza. (Isaac 722 and 724.)

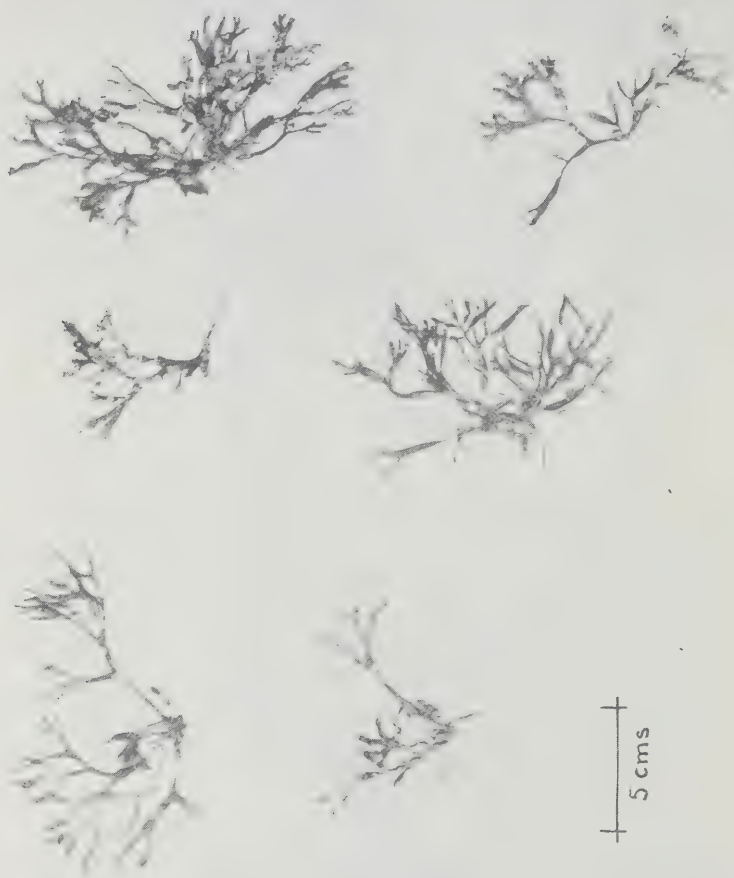


PLATE XXXII. Range of forms of *Gracilaria millardetii* (Mont.) J. Ag. collected at Xai-Xai.

GIGARTINALES

Gracilaria denticulata Schmitz ex Mazza.(Mazza: *Nuova Not.*, Vol. 18, p. 138.)Sub-nom. *Tylopus denticulatus*Papenfuss: *Bot. Not.*, 1940, p. 221, Fig. 15.

In a later paper than that cited above, Papenfuss transferred this taxon back to the genus *Gracilaria* (Papenfuss, 1951). Nutritive filaments are present which arise from the gonimoblast and fuse with cells of the pericarp.

Gracilaria denticulata (Plate XXXI) grows on the upper part of the seaward cliff of the reef where it is subjected to considerable wave action.

This species occurs on the east and south-east coasts of the Union.

Gracilaria millardetii (Mont.) J. Ag.Sub-nom. *Rhodymenia millardetii*.(Montagne et Millardet: *Algues*, p. 9, Pl. 25, Fig. 3.)Sub-nom. **Gracilaria millardetii**.J. G. Agardh: *Till Alg. Syst.*, VII, p. 64.Börjesen: *Mauritius Marine Algae*, III, Pt. 2, p. 72.

" : " " " Additions II, p. 26.

As will be evident from a review of the literature, this is a very variable species. Most of the material collected at Xai-Xai was either a broad *linearifolia* type (Börjesen, 1943, p. 75, Fig. 40) or resembled fairly closely the plant illustrated in Börjesen "Some Marine Algae from Mauritius. Additions II", p. 30, Fig. 13. Plants near to var. *crenulata* Börjesen, 1943, p. 74, Fig. 39) were also observed. A range of forms collected at Xai-Xai are illustrated in Plate 5. A number of specimens were examined in section and in all a medulla of large cells flanked on either side by a narrow cortical zone was observed. The sections examined were thicker and had a greater number of cells in section than described and illustrated by Börjesen (1943, Fig. 38, p. 73) who indicates elsewhere, however, that the thicknesses of the thallus varies for the different forms (Börjesen, 1950). Clearly more data are needed for determining the range of variation in anatomical structure.

Several cystocarpic plants were collected at Xai-Xai.

Plants of *Gracilaria millardetii* f. *exposita* Börgs (Isaac, 167, 168) and approaching f. *exposita* (Isaac 166, 815) have been collected by me at Isipingo and Reunion rocks in the Durban area. Cystocarpic material was collected at Isipingo in July 1953. Papenfuss (1943, p. 87) refers to plants of *Gracilaria protea* J. Ag. collected by him on the Natal coast.

Having examined South African material named *Gracilaria protea* by Papenfuss, Börgesen remarks that it seems to him "to be clearly related to if not identical with certain forms of *Gracilaria Millardetii* as he interprets the species." (Börgesen, 1950, p. 36.)

***Hypnea rosea* Papenfuss.**

Univ. Calif. Pubs. Bot., Vol. 23, p. 1, Pl. 1, Fig. 1, Pl. 2, Fig. 5.

Material of this species collected at Xai-Xai agreed very well with material named by Papenfuss in the Stephenson collection in the Botany Department. It agreed also with the description given by Papenfuss in regard to colour, epiphytic habit, intertidal position and anatomy. In regard to morphology, Papenfuss describes the branches as being "beset with short, 0.5—2 mm. long, determinate, spiniform ramuli". As indicated in Fig. 16 the short determinate branches frequently exceeded the dimensions given by Papenfuss.

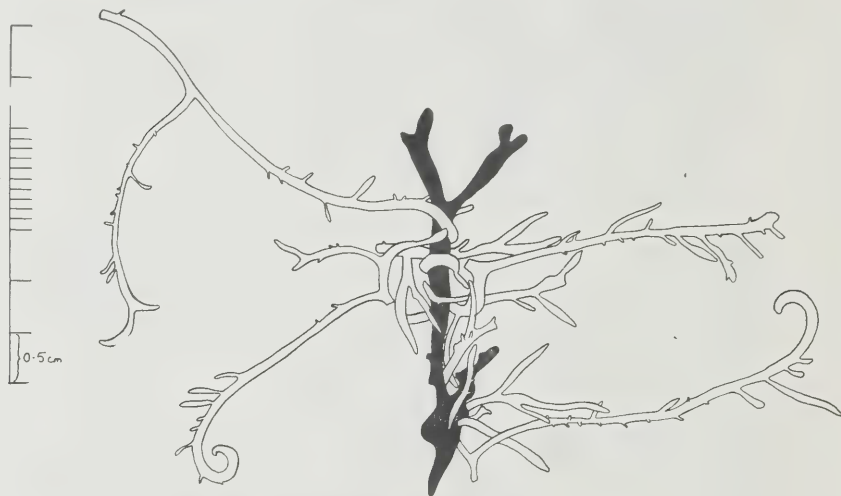


FIG. 16. *Hypnea rosea* Papenfuss. (Isaac 724; B.419.)

The known distribution range is given by Papenfuss as the Natal coast, on which coast it has been collected by me at a few localities. I have also collected the species at Tergniet, near Mossel Bay. The Tergniet record represents a very considerable westward extension of the recorded distribution range of *Hypnea rosea*.

***Plocamium corallorhiza* (Turn.) Harv.**

Sub-nom. *Fucus corallorhiza*.

Turner: *Fuci*, Vol. 2, p. 70, Pl. 96.

Sub-nom. *Plocamium corallorhiza*.

Harvey: *Nereis Australis*, p. 121.

Sub-nom. *Thamnophora corallorhiza*.

Kütz: *Tab. Phyc.*, Vol. 16, p. 20, Pl. 56.

Tetrasporic material was collected.

This beautiful species is widely distributed on the coasts of the Union, occurring on the east, south and southern parts of the west coast. Fertile plants growing on the coast westwards of East London are larger than fertile plants growing on the east coast, especially those found on the Natal coast. The fertile plants collected at Xai-Xai were of comparable size to those growing on the coast of Natal.

***Plocamium glomeratum* J. Ag.**

See "Inhaca Algae", p. 185.

RHODYMENIALES

***Rhodymenia natalensis* Kylin.**

See "Inhaca Algae", p. 186.

This species was also collected at Quissico by Gomes Pedro.

CERAMIALES

***Dasya scoparia* Harv.**

Harvey: *Nereis Australis*, p. 62, Pl. 21.

The plants from Xai-Xai named *Dasya scoparia* correspond in size, habit and morphology to Harvey's description of the species. There is, however, a divergence in regard to anatomy.

As seen from the locality records given below this species is widely distributed on the east and south-east coasts of the Union: Kei Mouth⁴ (Flanagan record cited by Barton, 1893); Kowie⁵, Cape Morgan⁶ (Delf and Michell, 1921); Port Natal, i.e. Durban (Krauss record cited by Harvey, 1847); Port Elizabeth, East London (Stephenson, 1947).

Localities on the Union coast not cited above at which the plant was collected by me are Dwesa and Port St. Johns, both on the east coast of the Cape Province.

Harvey (1847) also records the species from Green Point which is a little north of Cape Town. Confirmation of this locality record is necessary since it is so far to the west of the other records and since sea temperatures are decidedly lower at Green Point than on the south-east and east coasts of the Union.

⁴Kei Mouth, about 40 miles north of East London.

⁵Kowie or Port Alfred, about 80 miles east of Port Elizabeth.

⁶Cape Morgan, about 5 miles south of Kei Mouth.

Laurencia complanata (Suhr) Kütz.

Sub-nom. *Chondria complanata*.

(Suhr: in Krauss, *Flora*, Vol. 29, p. 211.)

Sub-nom. *Laurencia complanata*.

Kützing: *Species Algarum*, p. 857.

This plant (Plate XXXIII-a) was for long known in the Union as *Laurencia concinna* but in 1943 Papenfuss pointed out that it should be named *L. complanata* (Papenfuss, 1943, p. 91).

It occurs at low intertidal levels at Xai-Xai and on the east coast of the Union.

Martensia elegans Hering.

Hering: *Ann. Mag. Nat. Hist.*, Vol. 8, p. 92.

Harvey: *Nereis Australis*, p. 73, Pl. 43.

Okamura: *Japanese algae*, Vol. 2, p. 5, Pl. 53.

The substitution of *Mesotrema* for *Martensia* was suggested by Papenfuss (1942) who later (1950) proposed that the name *Martensia* should be conserved. Silva (1952, p. 291) concurred with this view. The proposal that *Martensia* should be conserved was adopted at the Paris International Botanical Congress (Lanjouw, 1956, p. 207).

This species (Plate XXXIII b) was found at low levels on the landward side of the reef and thus in situations sheltered from the full force of the sea. The plants when collected were of a dirty straw yellow colour giving the impression of being moribund. When mounted on herbarium sheets and when first put into formalin-sea water, they regained their delicate pink colour. Among the plants collected some were cystocarpic.

Martensia elegans occurs on the east coast of the Union and has been collected by me from a little north of Umhlali⁷ to Mpandi which is about 170 miles south of Durban. This range corresponds to that given by Stephenson (1947)—Umhlali to the Haven—who, however, also records a single plant found by Dr. M. A. Pocock at Gonubie, about eight miles north-east of East London.

ACKNOWLEDGEMENTS

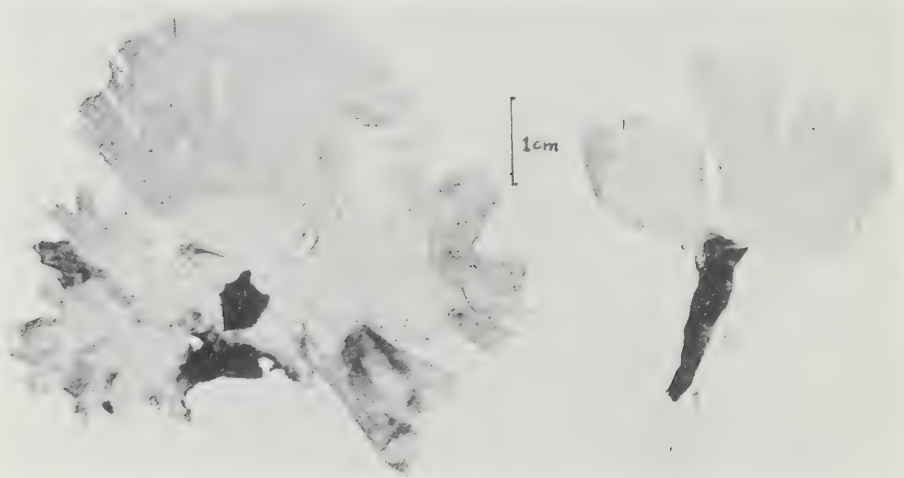
Thanks are due to the C.S.I.R. for South Africa for financial aid to collect the material described in this paper and for facilitating investigation of the collected material by the provision of a research assistant.

To Miss Yvonne M. Chamberlain of the British Museum of Natural History I am indebted for her collaboration and help while she was my research assistant at Cape Town University in 1956. All but one of the drawings included in this paper were made by her.

⁷Somewhat over 30 miles north of Durban.



PLATE XXXIII
(a) *Laurencia complanata* (Suhr) Kütz. (Isaac 717).



(1.) *Martensia elegans* Hering. (Isaac 718.)

Fig. 15 was drawn by Mrs. Sheila Simons to whom thanks are also due for criticism of the manuscript of this paper.

I wish to thank Mr. Herbert Pahl for his co-operation in providing suitable transport and camping facilities which made the excursion from Lourenço Marques to Xai-Xai possible.

To the various acknowledgements made in this paper I would add my thanks to Mr. R. H. Simons for taking the photographs published here.

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